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Note on the Intersections of Two Curves.

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In Salmon's "Higher Plane Curves" (p. 16), the theorem is given that if of the n^2 points of intersection of two curves of the n^{th} order np lie on a curve of the p^{th} order, a curve of the $(n-p)^{\text{th}}$ order may be passed through the remaining $n(n-p)$ of the points. It can likewise be proved that if of the mn intersections of two curves of the m^{th} and n^{th} orders, np lie on a curve of the p^{th} order (where $m > n$ and $m > p$), a curve of the $(m-p)^{\text{th}}$ order can be passed through the remaining $n(m-p)$ intersections. For through any $\frac{1}{2}(m-p)(m-p+3)$ of the remaining points we can pass a curve of the $(m-p)^{\text{th}}$ order which, with the curve of the p^{th} order, forms a curve of the m^{th} order, of whose points of intersection with the curve of the n^{th} order

$$np + \tfrac{1}{2}(m-p)(m-p+3)$$

coincide with those of the given curves of the m^{th} and n^{th} orders. If, then, this number is equal to or greater than the number of points required to determine all the intersections of a curve of the m^{th} with a curve of the n^{th} order, the composite curve of the m^{th} order will pass through all the intersections of the given curves, and hence the curve of the $(m-p)^{\text{th}}$ order will pass through all but the given np of them which lie on the curve of the p^{th} order. The proposition is therefore true if

$$np + \tfrac{1}{2}(m-p)(m-p+3) \geqq mn - \tfrac{1}{2}(m-1)(m-2),$$

which reduces to

$$(p-1)(p-2) + 2(m-n)(m-p) \geqq 0;$$

and this is evidently always true.